



Caltrans Division of Research,
Innovation and System Information

Research Results

Transportation
Safety and
Mobility

JANUARY 2014

Project Title:

Midwest States Pooled Fund Crash
Test Program SPR-3(017): Retest of the
Asymmetrical MGS (Midwest Guardrail
System) Transition

Task Number: 1009

Start Date: January 1, 2003

Completion Date: August 14, 2013

Product Category: New technical
standard, plan, and specification

Task Manager:

David Whitesel
Transportation Engineer
david.whitesel@dot.ca.gov

Guardrail Modifications to Improve Safety

*The taller Midwest Guardrail System better protects motorists
in today's higher vehicles*

WHAT WAS THE NEED?

State departments of transportation across the country use strong-post, W-beam guardrail systems to prevent errant vehicles from leaving the roadway and encountering safety hazards. The existing W-beam barriers, which measure 27 5/8" to the top of the rail, were developed years ago and did not envision today's vehicles that have a higher center of gravity. To meet the National Cooperative Highway Research Project (NCHRP) 350 Test Level 3 safety conditions, the taller Midwest Guardrail System (MGS) was designed as part of the Midwest States Pooled Fund Program. The non-proprietary MGS uses nearly all the same components as a conventional guardrail, but is engineered for today's higher passenger vehicles. It has been successfully tested with curbs and over long spans.

It is common practice to use W-beam guardrails along highway segments and to use a stiffened three beam guardrail in a transition region near the end of a bridge. W-beam guardrails tend to be more flexible than bridge railings, so a transition is added between the rail systems to provide structural continuity. A W-beam to three-beam transition had been developed for the MGS system, but previous crash testing efforts with passenger-size and small car sedans had mixed results, and performance with light truck vehicles was not evaluated. The transition element was modified and needed to be evaluated under the current federal safety standards.

WHAT WAS OUR GOAL?

The goal was to evaluate the safety performance of the redesigned W-beam to three-beam transition element for the taller MGS developed to address the size of today's vehicles.

*Testing the performance
of the guardrail*



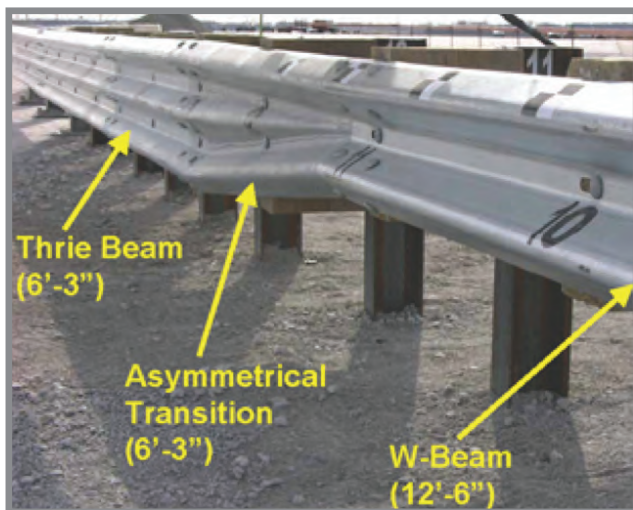
DRISI provides solutions and
knowledge that improve
California's transportation system.

WHAT DID WE DO?

Caltrans partnered with 17 state departments of transportation to design and test the MGS transition system. Caltrans monitored the researchers' work and provided comments during development. The research included four full-scale vehicle crash tests, three with a 3/4-ton pickup truck and one with a small car. Due to vehicle rollover in the first pickup truck test, the transition was redesigned as an asymmetrical W-beam to thrie beam, and the height of the W-beam was increased to the MGS height of 31 inches. The safety performance of the asymmetrical MGS W-beam to thrie-beam transition element was determined to be acceptable according to the NCHRP criteria. After the research was concluded, the Caltrans team worked with the traffic operations division to adopt the new plans and specifications.

WHAT WAS THE OUTCOME?

The new transition design is compliant with federal crash testing safety guidelines and can now be used on the national highway system.



Asymmetrical W-beam to thrie-beam transition

WHAT IS THE BENEFIT?

By joining this pooled fund, Caltrans was able to leverage the group's expertise to improve California's roadside safety systems along highways and rural routes with a minimal investment. The new guardrail is more robust than existing designs and meets federal safety requirements. Caltrans can now install this new system on the state highways.

LEARN MORE

For information about the pooled fund project:
www.pooledfund.org/Details/Study/162

To view the complete report:
<http://engineering.unl.edu/specialty-units/mwrsf/MwRSF-Downloads/MGS/TRP-03-167-07.pdf>



The redesigned guardrail is engineered for today's higher passenger vehicles.